second issue is that it is not always possible to place discrete actuators as close to each other as required because of their fairly large size.

Against this background, and from a first aspect, the present invention resides in a deformable mirror comprising a reflective surface provided on a substrate and a layer of deformable material attached to the substrate that is operable to deform the mirror and wherein the substrate is supported by an actuator that is operable to deform the mirror. The actuator can be used to provide the basic deformation required of the mirror (e.g. focus), while the deformable material can be used to provide fine tuning of the mirror shape. In this arrangement, the substrate no longer needs to be supported from the edge and so the resonance frequency and bandwidth is increased over and above what it would be for a purely edge-supported device. This means it is possible to concentrate on optimising the design of the deformable material to give the maximum curvature with less constraint from the resonance effects.

Preferably, the deformable mirror comprises a plurality of actuators that support the substrate. Optionally, the actuators are arranged to be operable to correct lower order Zernike modes. Preferably, the layer of deformable material is segmented, the segments being arranged to be operable to correct higher order Zernike modes. Optionally, the deformable material comprises peizoelectric material. Preferably, the actuator comprises magnetostrictive or electrostrictive material.

From a second aspect, the invention resides in a method of correcting phase variations in a beam of electromagnetic radiation incident upon the deformable mirror described above, wherein the actuator or actuators are moved to correct for distortions described by Zernike modes at or below a threshold order and the deformable material is moved to correct for distortions described by Zernike modes above the threshold order. Other preferred, but optional, features of the invention are set out in the appended claims.

In order that the invention can be more readily understood, reference will now be made, by way of example only, to the accompanying drawings in which:

CLAIMS

1. A deformable mirror comprising a reflective surface provided on a substrate and a layer of deformable material attached to the substrate that is operable to deform the mirror and wherein the substrate is supported by an actuator that is operable to deform the mirror.

2. A deformable mirror according to claim 1, comprising a plurality of actuators that support the substrate.

3. A deformable mirror according to claim 2, wherein the actuators are arranged to be operable to correct lower order Zernike modes.

4. A deformable mirror according to any preceding claim, wherein the layer of deformable material is segmented and the segments are arranged to be operable to correct higher order Zernike modes.

5. A deformable mirror according to any preceding claim, wherein the deformable material comprises piezoelectric material.

6. A deformable mirror according to any preceding claim, wherein the actuator comprises magnetostrictive or electrostrictive material.

7. A deformable mirror and deformable-mirror holder, comprising a deformable mirror according to any preceding and wherein the holder comprises a body with a central aperture for receiving the deformable mirror, the central aperture being defined by a plurality of flexible beams, with each flexible

beam having an end shaped to provide a supporting surface and a flexible portion that connects the beam's end to the holder's body.

8. A deformable mirror and deformable-mirror holder according to claim 7, wherein the ends of the flexible beams are co-joined to form a unitary structure shaped to provide a supporting surface.

9. A deformable mirror and deformable-mirror holder according to claim 7 or claim 8, wherein the beams' ends lie in the plane of the holder's body such that, in use, the mirror is received within the holder's body.

10. A deformable mirror and deformable-mirror holder according to any of claims 7 to 9, wherein at least one beam is generally L-shaped such that one leg of the L-shape provides the flexible portion and the other leg of the L-shape provides the supporting surface of the beam's end.

11. A deformable mirror and deformable-mirror holder according to claim 10, wherein the internal corner of the L-shaped beam has a shoulder that extends part of the way along both legs of the L-shape.

12. A deformable mirror and deformable-mirror holder according to any of claims 7 to 11, wherein the plurality of flexible beams are arranged around the entire aperture.

13. A deformable mirror and deformable-mirror holder according to claim 12, wherein the width of the beams is larger than the separation between beams.

14. A deformable mirror and deformable-mirror holder according to claim 13, wherein the width of the beams is greater than four times the separation between beams.

15. A deformable mirror and a deformable-mirror holder according to claim 10, wherein the peripheral edge of the mirror is supported from below by one leg of the L-shaped beam and is supported from the side by the other leg of the L-shaped beam.

16. A deformable mirror and a deformable-mirror holder according to claim 11, wherein the peripheral edge of the mirror is supported from below by one leg of the L-shaped beam and is supported from the side by an inwardly-facing side of the shoulder.

17. A method of correcting phase variations in a beam of electromagnetic radiation incident upon the deformable mirror of any of claims 1 to 6, wherein the actuator or actuators are moved to correct Zernike modes at or below a threshold order and the deformable material is moved to correct Zernike modes above the threshold order.

18. A method according to claim 17, wherein the actuator or actuators are moved to correct the first and second ordered Zernike modes and the deformable element is moved to correct third and higher order Zernike modes.

19. A deformable mirror substantially as described herein with reference to any of the accompanying Figures.

20. A deformable mirror and deformable-mirror holder substantially as described herein with reference to any of the accompanying Figures.

21. A method of correcting phase variations substantially as described herein with reference to any of the accompanying Figures.